O&M Cost Reduction of a Coal-Fired US Merchant Plant Through an Optimized SCR Management Strategy Involving Catalyst Regeneration

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Summary

This paper outlines how PG&E National Energy Group and SCR-Tech LLC jointly developed an entirely new catalyst management strategy for the coal-fired Indiantown Generating Plant. The driving force was to significantly reduce the long-term operating cost of the SCR system by taking full advantage of the possibility of catalyst regeneration which is significantly cheaper than the traditional catalyst replacement. The jointly developed new catalyst management strategy yields numerous tangible and intangible benefits for the operation of this 330 MW coal-fired boiler, which are quantified as a reduction in the overall SCR O&M costs. The cost savings improves the economic success of the Indiantown Generating Plant as an IPP merchant plant, which supplies electricity to a regional utility year round as well as process steam to a local industrial complex during the winter months between November and May.

The high-dust SCR system of the Indiantown Generating Plant is located between the economizer outlet and the air heater inlet and has been in operation since 1996. The SCR reactor originally started up with 1 and a half layers of catalyst in 1996, another half layer was added later, and finally in 2000, an additional layer was added – a half layer in the Spring and a second half layer in the Fall bringing it to a total of three catalyst layers. Subsequently, new catalyst has always been added and the oldest layer has been replaced as soon as the NOx removal efficiency dropped below the design value while not exceeding the desired ammonia slip.

Under the newly developed catalyst management strategy, the operation of the SCR reactor will be changed from a three full-layer operating scheme to a four half-layer (equals two full layers) operating scheme. Thus, in the future, the Indiantown SCR reactor will be operated with only four active half layers which is equivalent to two active full layers, while the fifth and sixth half layer act as standby layers. These standby half layers will be used as needed in order to optimize the catalyst exchange program from a cost and timing point of view. As soon as the NOx removal efficiency drops below the required permit limit value for NOx emissions while not exceeding the desired low ammonia slip, the least active half layer will be removed during a scheduled outage and a previously regenerated half layer that is being kept in stand-by at all times, will be added instead. After such a quick exchange of a half layer, the SCR system will immediately go back into operation. The extracted half catalyst layer will be regenerated by SCR Tech and returned to the Indiantown Generating Plant right away to serve as the next stand-by half layer for the next catalyst exchange cycle. The jointly developed catalyst management strategy is tailored to the exchange of a half layer

only during a scheduled outage. The paper outlines this jointly developed new catalyst management strategy in detail and quantifies the significant overall cost savings. A comparison is provided to the previously used traditional way of operating the SCR system on three full layers and always replacing spent catalyst with new catalyst.

Taking full advantage of catalyst regeneration allows for substantial overall operating cost reductions for the SCR system operator by largely avoiding replacement of catalyst. The Indiantown Generating Plant can additionally fully benefit from the four half-layer operation through a reduced pressure drop resulting in a lower parasitic load of the plant and consequently higher revenues through higher net electricity sales to the local utility. Also, the overall 50% lower SO_2/SO_3 conversion of the SCR system results in a significantly reduced SO_3 concentration in the flue gas system after the SCR reactor. This is highly beneficial for the continuous maintenance requirements of the equipment downstream of the SCR system including the air preheater, the FGD spray dryer absorber, and the baghouse.

The fact that no spent catalyst needs to be disposed of leads to intangible benefits in form of the avoidance of any potential hazardous waste disposal issues as well as a greatly reduced pending liability for the operator associated with the potential disposal of spent SCR catalyst as hazardous waste. The combination of all these tangible and intangible benefits led PG&E National Energy Group as the operator of the Indiantown Generating Plant to join forces with SCR-Tech LLC for the development of this new catalyst management strategy.